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| 10/029,864 | 12/31/2001 | Kouji Yoshida | 217879US2 CONT | 4023 |

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| EXAMINER | |
|---|---|
| DOUGHERTY, ANTHONY T | |
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| 2863 | |

DATE MAILED: 11/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/029,864 | YOSHIDA, KOUJI | |
| | Examiner | Art Unit | |
| | Anthony T. Dougherty | 2863 | |

*-- The MAILING DATE of this communication appears on the cover sheet with th correspondence address --*

**Peri d for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *17 April 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-53* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-35,37-41,43,45,47,49 and 50* is/are rejected.

7)☒ Claim(s) *36,42,44,46,48 and 51-53* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 December 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-35 and 37-41, 43, 45, 47, and 49-50 rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 4,955,062 to Terui.

With regard to claim 1 Terui discloses a mark detection method (see abstract) by measuring a surface state of an area on an object (see Figure 2 & column 3 line 48 through line 60), including a mark-formed area in a predetermined direction (see Figure 2 & column 3 line 44 through line 46), a no-mark area formed on the outside of the mark-formed area in the same predetermined direction (see Figure 2 & column 3 line 39 through line 48), the no-mark area having a characteristic compared to other areas (see Figure 2), running a window having a dimension corresponding to the no-mark area (see Figure 3 & column 4 line 16 through line 27), obtaining a quantity denoting the surface state of an area in the window moving across the no-mark area having a characteristic based on measurement results obtained through the window during the measuring step (see column 6 line 19 through line 40), and extract an area having a measurement result reflecting the mark based on the quantity varying with the position of the window (see column 6 line 41 through line 56).

With regard to claim 2, and applying the rejection of claim 1 above, Terui discloses the no-mark area consists of two areas on both sides of the mark formed area along the predetermined direction (see Figure 3).

With regard to claim 3, and applying the rejection of claim 1 above, Terui discloses the quantity includes one of average and variance of values in a measurement result through the window (see Figure 2).

With regard to claim 4, and applying the rejection of claim 3 above, Terui discloses detecting a position of the mark in the predetermined direction based on the measurement result of the extracted area (see column 6 line 41 through line 56).

With regard to claim 5, and applying the rejection of claim 4 above, Terui discloses detecting the mark based on one of average and variance after removing noise from the measurement result (see column 5 line 32 through line 66).

With regard to claim 6, and applying the rejection of claim 1 above, Terui discloses one of average and variance values are integrated on a line perpendicular to predetermined direction (see column 4 line 50 through line 63).

With regard to claim 7, and applying the rejection of claim 6 above, Terui discloses detecting a position of the mark in the predetermined direction based on the measurement result of the extracted area (see column 6 line 41 through line 56).

With regard to claim 8, and applying the rejection of claim 7 above, Terui discloses detecting the mark based on one of average and variance after removing noise from the measurement result (see column 5 line 32 through line 66).

With regard to claim 9, and applying the rejection of claim 1 above, Terui discloses detecting a position of the mark in the predetermined direction based on the measurement result of the extracted area (see column 6 line 41 through line 56).

With regard to claim 10, and applying the rejection of claim 1 above, Terui discloses the surface state includes a state of light from a surface of the object (see column 3 line 48 through line 60).

With regard to claim 11, and applying the rejection of claim 1 above, Terui discloses the measuring measures a state of a surface with a plurality of dimensions (see Figure 2), and extracting extracts an area having a plurality of dimensions and a measurement result reflecting the mark (see column 6 line 41 through line 56).

With regard to claim 12 Terui discloses a mark detection method (see abstract) by measuring a surface state of an area on an object (see Figure 2 & column 3 line 48 through line 60), including a mark-formed area in a predetermined direction (see Figure 2 & column 3 line 44 through line 46), a no-mark area formed on the outside of the mark-formed area in the same predetermined direction (see Figure 2 & column 3 line 39 through line 48), the no-mark area having a characteristic compared to other areas (see Figure 2), running a window having a dimension corresponding to the mark area (see Figure 3 & column 4 line 16 through line 27), obtaining a quantity denoting the surface state of an area in the window moving across the mark area having a characteristic based on measurement results obtained through the window during the measuring step (see column 6 line 19 through line 40), and extract an area having a measurement result reflecting the mark based on the quantity varying with the position of the window (see column 6 line 41 through line 56).

With regard to claim 13, and applying the rejection of claim 12 above, Terui discloses the quantity includes one of average and variance of values in a measurement result through the window (see Figure 2).

With regard to claim 14, and applying the rejection of claim 13 above, Terui discloses detecting a position of the mark in the predetermined direction based on the measurement result of the extracted area (see column 6 line 41 through line 56).

With regard to claim 15, and applying the rejection of claim 14 above, Terui discloses detecting the mark based on one of average and variance after removing noise from the measurement result (see column 5 line 32 through line 66).

With regard to claim 16, and applying the rejection of claim 12 above, Terui discloses one of average and variance values are integrated on a line perpendicular to predetermined direction (see column 4 line 50 through line 63).

With regard to claim 17, and applying the rejection of claim 16 above, Terui discloses detecting a position of the mark in the predetermined direction based on the measurement result of the extracted area (see column 6 line 41 through line 56).

With regard to claim 18, and applying the rejection of claim 17 above, Terui discloses detecting the mark based on one of average and variance after removing noise from the measurement result (see column 5 line 32 through line 66).

With regard to claim 19, and applying the rejection of claim 12 above, Terui discloses detecting a position of the mark in the predetermined direction based on the measurement result of the extracted area (see column 6 line 41 through line 56).

With regard to claim 20, and applying the rejection of claim 12 above, Terui discloses the surface state includes a state of light from a surface of the object (see column 3 line 48 through line 60).

With regard to claim 21, and applying the rejection of claim 12 above, Terui discloses the measuring measures a state of a surface with a plurality of dimensions (see Figure 2), and extracting extracts an area having a plurality of dimensions and a measurement result reflecting the mark (see column 6 line 41 through line 56).

With regard to claim 22, Terui discloses a mark detection unit for detecting a mark on an object (see abstract) a measuring unit which measures a surface state of an are of the object (see column 3 line 48 through line 60), including a mark in a predetermined direction (see Figure 2 & column 3 line 44 through line 46), running a window having a dimension corresponding to a specific area on the object having a characteristic different from other areas (see Figure 3 & column 4 line 16 through line 27), obtaining a quantity denoting the surface state of an area in the window moving across the specific area having a characteristic based on measurement results obtained through the window during the measuring step (see column 6 line 19 through line 40), and extract an area having a measurement result reflecting the mark based on the quantity varying with the position of the window (see column 6 line 41 through line 56).

With regard to claim 23, and applying the rejection of claim 3 above, Terui discloses a position computing unit which obtains position of the mark in the predetermined direction based on the measurement result of the extracted area (see column 6 line 41 through line 56).

With regard to claim 24, and applying the rejection of claim 22 above, Terui discloses the measuring unit comprises an image pick up unit (see column 3 line 48 through line 60) and the result is light intensities of a mark image (see column 4 line 38 through line 45).

With regard to claim 25, and applying the rejection of claim 22 above, Terui discloses the surface state includes a state of light from a surface of the object (see column 3 line 48 through line 60).

With regard to claim 26, and applying the rejection of claim 22 above, Terui discloses the specific area is an area where the mark is formed (see Figure 3 & column 4 line 16 through line 27).

With regard to claim 27, and applying the rejection of claim 22 above, Terui discloses the specific area is an area outside the mark formed area (see Figure 3 & column 4 line 16 through line 27).

With regard to claim 28, and applying the rejection of claim 22 above, Terui discloses the window has a shape corresponding to the specific area having a plurality of dimensions on the object (see Figure 2 & Figure 3 & column 4 line 16 through line 27).

With regard to claim 29 Terui discloses a mark detection method (see abstract) by measuring a surface state of an area on an object (see Figure 2 & column 3 line 48 through line 60), including a mark area in a predetermined direction (see Figure 2 & column 3 line 44 through line 46), obtaining a feature-quantity denoting the surface state of each of partitioned areas based on results obtained during the measuring step (see column 6 line 19 through line 40), extracting a predetermined area having a measurement result reflecting the mark based on the feature-quantity (see column 6 line 41 through line 56), obtaining a second feature-quantity that is different form the first and denotes a feature of the surface state of the predetermined area based on the measurement results obtained during the measurement step (see Figure 2 & column 6 line 19 through line 39), and detecting a position of the mark in the predetermined direction based on the second feature-quantity (see column 6 line 41 through line 56).

With regard to claim 30, and applying the rejection of claim 29 above, Terui discloses a no-mark area on the outside of a mark-formed area in a predetermined direction (see Figure 2 & column 3 line 39 through line 48), the no-mark area having a characteristic compared to other areas (see Figure 2), running a window having a dimension corresponding to the no-mark area (see Figure 3 & column 4 line 16 through line 27), obtaining the first feature-quantity based on measurement results obtained through the window (see column 6 line 19 through line 40), and

extracts the predetermined area based on the first feature-quantity varying with the position of the window (see column 6 line 41 through line 56).

With regard to claim 31, and applying the rejection of claim 30 above, Terui discloses the no-mark area consists of two areas on both sides of the mark formed area along the predetermined direction (see Figure 3).

With regard to claim 32, and applying the rejection of claim 30 above, Terui discloses the first feature-quantity includes one of average and variance of values in a measurement result through the window (see Figure 2).

With regard to claim 33, and applying the rejection of claim 29 above, Terui discloses the first feature-quantity includes one of average and variance of values in a measurement result through the window (see Figure 2).

With regard to claim 34, and applying the rejection of claim 29 above, Terui discloses a mark area on the inside of a mark-formed area in a predetermined direction (see Figure 2 & column 3 line 39 through line 48), the mark area having a characteristic compared to other areas (see Figure 2), running a window having a dimension corresponding to the mark area (see Figure 3 & column 4 line 16 through line 27), obtaining the first feature-quantity based on measurement results obtained through the window (see column 6 line 19 through line 40), and extracts the

predetermined area based on the first feature-quantity varying with the position of the window (see column 6 line 41 through line 56).

With regard to claim 35, and applying the rejection of claim 34 above, Terui discloses the first feature-quantity includes one of average and variance of values in a measurement result through the window (see Figure 2).

With regard to claim 37 Terui discloses a mark detection unit (see abstract) a measuring unit which measures a surface state of an area on an object (see Figure 2 & column 3 line 48 through line 60), including a mark area in a predetermined direction (see Figure 2 & column 3 line 44 through line 46), an extracting/computing unit which obtains a feature-quantity denoting the surface state of each of partitioned areas based on results obtained during the measuring step (see column 6 line 19 through line 40), extracts a predetermined area having a measurement result reflecting the mark based on the feature-quantity (see column 6 line 41 through line 56), obtains a second feature-quantity that is different form the first and denotes a feature of the surface state of the predetermined area based on the measurement results obtained during the measurement step (see Figure 2 & column 6 line 19 through line 39), and detects a position of the mark in the predetermined direction based on the second feature-quantity (see column 6 line 41 through line 56).

With regard to claim 38, and applying the rejection of claim 37 above, Terui discloses running a window having a dimension corresponding to a specific area having a characteristic

different from other areas (see Figure 3 & column 4 line 16 through line 27), obtaining the first feature-quantity based on measurement results obtained through the window (see column 6 line 19 through line 40), and extracts the predetermined area based on the first feature-quantity varying with the position of the window (see column 6 line 41 through line 56).

With regard to claim 39, and applying the rejection of claim 38 above, Terui discloses the window has a dimension corresponding to a no-mark area on the outside of a mark-formed area in a predetermined direction (see Figure 2 & column 3 line 39 through line 48), the no-mark area having a characteristic compared to other areas (see Figure 2).

With regard to claim 40, and applying the rejection of claim 38 above, Terui discloses the window has a dimension corresponding to a mark area on the inside in a predetermined direction (see Figure 2 & column 3 line 39 through line 48), the mark area having a characteristic compared to other areas (see Figure 2).

With regard to claim 41, and applying the rejection of claim 38 above, Terui discloses the first feature-quantity includes one of average and variance of values in a measurement result through the window (see Figure 2).

With regard to claim 43, and applying the rejection of claim 1 above, Terui discloses an exposure method to transfer a predetermined pattern onto a plurality of divided areas on a substrate (see column 1 line 10 through line 16), obtain positions of divided areas by detecting a

second number of alignment marks out of a first number of alignment marks and are on the substrate and are of substantially the same shape (see Figure 3 & Figure 8 & column 9 line 36 through line 42), transferring the pattern to the divided areas (see column 10 line 42 through line 53).

With regard to claim 45, and applying the rejection of claim 12 above, Terui discloses an exposure method to transfer a predetermined pattern onto a plurality of divided areas on a substrate (see column 1 line 10 through line 16), obtain positions of divided areas by detecting a second number of alignment marks out of a first number of alignment marks and are on the substrate and are of substantially the same shape (see Figure 3 & Figure 8 & column 9 line 36 through line 42), transferring the pattern to the divided areas (see column 10 line 42 through line 53).

With regard to claim 47, and applying the rejection of claim 29 above, Terui discloses an exposure method to transfer a predetermined pattern onto a plurality of divided areas on a substrate (see column 1 line 10 through line 16), obtain positions of divided areas by detecting a second number of alignment marks out of a first number of alignment marks and are on the substrate and are of substantially the same shape (see Figure 3 & Figure 8 & column 9 line 36 through line 42), transferring the pattern to the divided areas (see column 10 line 42 through line 53).

With regard to claim 49, and applying the rejection of claim 22 above, Terui discloses a stage unit which moves the substrate along a movement plane (see column 10 line 29 through line 41), a mark detection unit which detects alignment marks in divided areas on the substrate mounted on the stage unit (see column 9 line 36 through line 42 & column 10 line 42 through line 53).

With regard to claim 50, and applying the rejection of claim 37 above, Terui discloses a stage unit which moves the substrate along a movement plane (see column 10 line 29 through line 41), a mark detection unit which detects alignment marks in divided areas on the substrate mounted on the stage unit (see column 9 line 36 through line 42 & column 10 line 42 through line 53).

***Allowable Subject Matter***

3. Claims 36, 42, 44, 46, 48, 51, 52, and 53 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

4. The following is a statement of reasons for the indication of allowable subject matter:

The primary reason for the allowance of claim 36 is the inclusion of the method step of detecting a mark where the second feature-quantity is a degree to which the surface state of a predetermined area and a template pattern corresponding to the mark are identical. It is this step found in each of the claims, as it is claimed in the combination, that has not been found, taught or suggested by the prior art of record which makes these claims allowable over the prior art.

The primary reason for the allowance of claim 42 is the inclusion of the limitation of the mark detection unit having a computing unit with a template pattern corresponding to the mark and the second feature-quantity includes a degree to which the surface state of the predetermined area and the template pattern are identical. It is this limitation found in each of the claims, as it is claimed in the combination, that has not been found, taught or suggested by the prior art of record which makes these claims allowable over the prior art.

The primary reason for the allowance of claims 44, 46, 48, 51, 52, and 53 is the inclusion of the method steps being an exposure method including a plurality of divided areas arranged in a matrix and aligning a wafer by detecting positions of marks in the row-direction of a fifth number of first alignment marks out of a third number of first alignment marks, and obtain positions of marks in the column-direction of a sixth number of second alignment marks out of a fourth number of second alignment marks, and obtain positions of the divided areas by performing a statistical process on positions in the row-direction of the fifth number of first alignment marks and positions in the column-direction of the sixth number of second alignment marks. It is these steps found in each of the claims, as they are claimed in the combination, that has not been found, taught or suggested by the prior art of record which makes these claims allowable over the prior art.

## *Conclusion*

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent No. 6,521,385 to Yoshida et al. because it teaches a mark detection method for alignment of a substrate for exposure including a window defining a mark and a no-mark area and using template matching for mark detection.

U.S. Patent No. 5,499,099 to Sato et al. because it teaches a mark detection method for exposure of a substrate including a movable stage, detecting surface features, an integrator, and mark detection by matching of zones and arrays.

U.S. Patent No. 5,493,403 to Nishi because it teaches detecting a mark on a substrate for alignment for exposure including a window defining a mark and no-mark area.

U.S. Patent No. 5,986,766 to Koga et al. because it teaches a mark detection method for alignment of a substrate for exposure including a window defining a mark and no-mark area, an integrator, a movable stage and mark detection by template matching.

U.S. Patent No. 5,734,478 to Magome et al. because it teaches a mark detection method for alignment of a substrate for exposure including a window defining a mark and a no-mark area and template matching for mark detection.

U.S. Patent No. 5,543,921 to Uzawa et al. because it teaches a mark detection method for alignment of a substrate for exposure including a window defining a mark and a no-mark area and using reliability data to determine positional information for the substrate.

U.S. Patent No. 6,333,786 to Uzawa et al. because it teaches a mark detection method for alignment of a substrate for exposure including a window defining a mark and a no-mark area and using reliability data to determine positional information for the substrate.

U.S. Patent No. 6,097,495 to Uzawa et al. because it teaches a mark detection method for alignment of a substrate for exposure including a window defining a mark and a no-mark area and using reliability data to determine positional information for the substrate.

U.S. Patent No. 6,549,648 to Rinn because it teaches a mark detection method for alignment of a substrate for exposure including a window defining a mark and a no-mark area.

U.S. Patent No. 6,539,326 to Hirano because it teaches a mark detection method for alignment of a substrate for exposure.

U.S. Patent No. 5,689,339 to Ota et al. because it teaches a mark detection method for alignment of a substrate for exposure including a window defining a mark and a no-mark area.

U.S. Patent No. 5,214,489 to Mizutani et al. because it teaches a mark detection method for alignment of a substrate for exposure including a window defining a mark and a no-mark area and using phase difference to detect position of the substrate.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony T. Dougherty whose telephone number is (703) 305-4020. The examiner can normally be reached on Monday through Friday from 8 to 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E. Barlow can be reached on (703) 308-3126. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

atd

John Barlow
Supervisory Patent Examiner
Technology Center 2800